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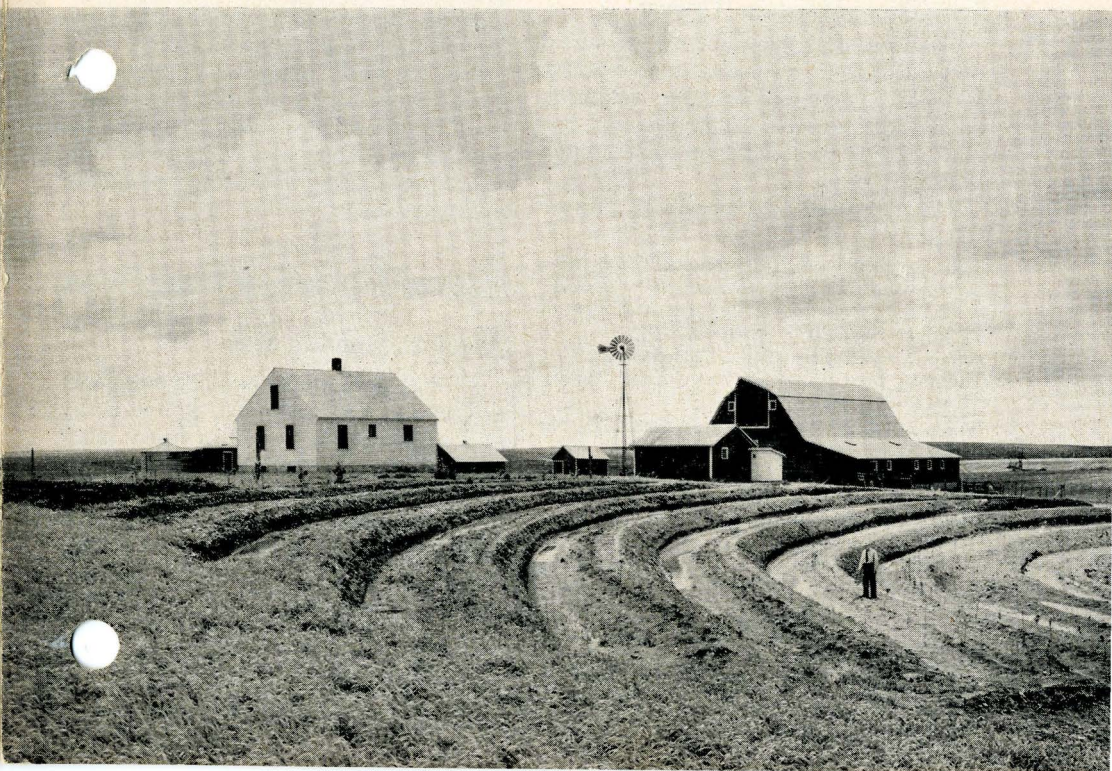
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Planting Windbreaks TO SURVIVE DROUTH IN SOUTH DAKOTA

EXTENSION SERVICE
SOUTH DAKOTA STATE COLLEGE



Planting Windbreaks

by FRANK I. ROCKWELL*

A Windbreak Is Worth Money to You

Besides the beauty and comfort a good windbreak adds to the farm home, many South Dakota farmers assert that a windbreak saves an actual \$350 a year by reducing the feed livestock must eat to keep warm.

The benefits of a windbreak are many: It protects buildings and equipment, reduces fuel consumption in the home, attracts and shelters birds which destroy insects. Without a windbreak to collect and hold snow and provide protection against hot drying and cold freezing winds, yard beautification with shrubs and flowers, and profitable production of fruit or vegetables is next to impossible. As the trees approach maturity, thinnings to take out undesirable trees provide useful fuel, fence posts and farm repairs.

Stop These Moisture Thieves

To successfully grow and maintain trees in South Dakota, it is necessary to conserve all moisture naturally available. Increasing the moisture speeds growth. Storing a surplus in the soil will maintain trees through future dry years.

There are four ways in which moisture is lost:

Sun: Heats and evaporates moisture from bare, unshaded surfaces. Flats, south and west slopes lose it the most rapidly, developing deep cracks in the ground through which moisture escapes.

Wind: Dries bare soil, whether shaded or unshaded. The more wind that sweeps through the planting, the more moisture is lost.

Weeds and Grass: Draw moisture from below the surface as deep as the roots penetrate.

Water Runoff: Much water from heavy rain or melting snow escapes even on slight slopes, particularly when bare or frozen.

* *Extension Forester*

Four Ways to Save Moisture

Reduce sun evaporation by planting on north and east slopes if possible and by spacing trees and shrubs so crowns will eventually grow together and shade the ground. Plant trees which can grow in the shade (such as boxelder and chokecherry) between other trees. These will eventually prevent weed and grass growth below, further stopping evaporation.

Reduce wind evaporation from the ground surface by (a) streamlining with shrubs, evergreens and shorter kinds in outer rows and taller species within. (See illustration on Page 4); (b) planting shrubs between trees and leaving tree branches so all fallen twigs and leaves will be left on the ground to build up a moisture absorbent soil mulch—the right kind of “forest floor.”

Cultivate cleanly to keep out weeds and grass where shading does not stop them growing. Summer following the season before planting helps control weeds.

Prevent Water runoff by running a row on level contours with terraces developed by plowing furrows or ditches between rows deep enough to retain all water from melting snows or heavy rains. (See cover illustration.)

Good Forestry Practices

Selecting Planting Site

Trees thrive best on north and east slopes and on sandy soils. On deep gravel, heavy clay, hardpan near surface or heavy infestation of noxious weeds tree-growing is difficult. Farmstead windbreaks should be placed to protect livestock, orchards and buildings from the west, north and south.

Preparing the Ground

The soil must be moist and deeply cultivated. Summer fallowing or clean cultivation a season in advance helps subdue the sod and control weeds. Saturating the planting site by collecting snow behind a snow fence or by diverting runoff water from surrounding land helps insure ample moisture at planting time.

Subsoiling the tree rows with a thin 18-inch blade makes planting easier, improves the job and gives the young trees a better start. Dragging plowed ground as soon as dry enough in the spring retards evaporation.

Terraces for the steeper slopes are most readily built during slack times the season before planting. Broad ridges which will support a single row cultivator are thrown up along contour lines surveyed on a 2/10 of one percent grade to a height sufficient to hold water or enable it to flow within the channels to a grassed waterway. Tree rows follow the crest of the terrace ridges so trees are not injured by machinery in cultivating and maintaining terrace channels.

Plant Plenty of Trees

From 500 to 1,000 trees and shrubs per acre are essential to insure that the crowns of the trees come together to shade the ground and protect the soil. Stock to be of proven hardiness should come from seed of trees growing in localities having equally or more severe climatic conditions. Deciduous trees should be 3/16 inches or more in diameter at root collar; evergreens two or three-year old transplants.

Mixed plantations of trees are less severely attacked by insect pests and disease, afford better shelter and food for wildlife, better protection to the soil and better conservation of moisture.

Planting the Trees

The best time for planting trees is just after frost is out in early spring.

Row intervals should fit farmer's machinery for easy cultivation. Twelve feet allows cultivation longer as the trees grow larger and is the minimum practical distances for terraces on steeper slopes. However, as the slopes become less steep, the rows are farther apart. It may be necessary to insert stub rows in the wider spaces.

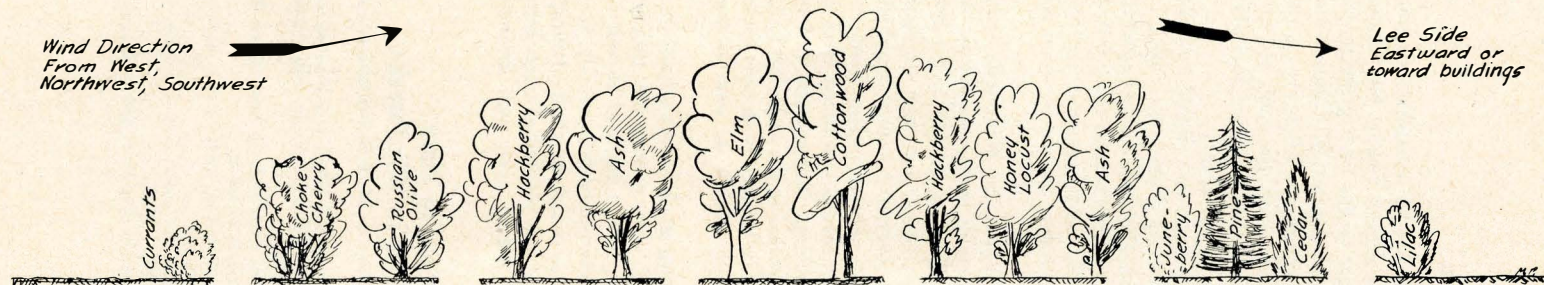
Spacing of trees in rows should be close enough to allow for losses. It's easier to thin than replant. Shrubs should be planted 2 to 4 feet apart; intermediate trees, 6 to 8 feet; fast growers, 8 to 10 feet; and conifers, 6 to 12 feet, with low shrubs between for protection.

Tree roots should be protected when planting by carrying in moist packing or wet burlap until planted. Do not allow holes to dry out. Roots too long or damaged should be shortened with a clean cut. Tops are pruned severely when roots are cut back, and on shrubs and many trees to force low branching. Roots must not be curled up or crowded in the hole, but hang down naturally, be covered with only moist soil, and be firmly packed as soon as possible.

Protect planting stock from slightest drying or freezing. Evergreens die quickly when roots dry, or are exposed to sun or wind. When unwrapped temporarily, cover roots with wet mulch or chaff or wrapping material. If not planted at once, bury roots in moist soil in cool, well drained, sheltered spot.

A Quick Method to Plant 12-24 Inch Trees in Windbreaks

1. Subsoil tree rows to 15-20 inches without exposing moist soil.
2. Scrape off dry topsoil where tree is to be set.
3. Reverse spade and insert blade, full depth, pulling dirt out of hole.
4. Insert blade in same hole to open a one or two-inch slit full depth of spade.
5. Place tree and spread roots against vertical wall of moist earth.
6. Lift spade and let moist dirt fall back in place, packing firmly with heel.
7. Replace first spadeful of earth and pack again.



DESIRABLE SPECIES AND THEIR ARRANGEMENT IN A WINDBREAK

Low Tough Hedge 1-3' apart 4-7' tall	Tall Hedge 3-6' apart 1-2 rows 6-15' tall	Hardwoods Alternated 6-10' apart 1-2 rows	Fast Growers 6-12' apart 1 or more rows	Hardwoods Alternated 6-10' apart 1 or more rows	Shade Enduring Shrubs 3-6' apart 1 row	Evergreens Low Shrubs Between 6-12' apart 1-2 rows	Decorative Hedge or Seedling Fruit 2-4' apart
3 Leaf Sumac	Chokecherry	Green Ash	Chinese Elm	Honey Locust	Chokecherry	Silver Cedar	Lilac
Golden Currant	Indigo Bush	Am. Elm	Am. Elm	Am. Elm	Juneberry	Red Cedar	Peking Cotoneaster
Silverberry	Siberian Buckthorn	Boxelder	Cottonwood	Hackberry	Honeysuckle	Ponderosa Pine	Currant
Sandcherry	Caragana	Hackberry	White Willow	Green Ash	Siberian Buckthorn	Douglas Fir	Gooseberry
Dwarf Juneberry	Wild Plum	Bur Oak	Boxelder	Am. Linden	Golden Currant	Colorado Spruce	Sandcherry
Chokecherry	Buffaloberry		Silver Maple	Black Walnut	Dogwood	Black Hills Spruce	Nanking Cherry
	Russian Olive			Kentucky Coffee Tree	Ginnala Maple	SHRUBS	Wild Plum
					Nannyberry	Sandcherry	Manchurian Apricot
					Hawthorn	3-Leaf Sumac	Siberian Crab

NO TWO FARMSTEADS ARE ALIKE; THIS PLAN WILL NOT BE EQUALLY SUITED TO ALL SITES

For dryest localities and most difficult sites where snowfall and possibilities of supplementary moisture from run-off moisture are limited, a three or four row windbreak

is more successful than a wider strip. Outside rows should consist of hardy shrubs for the first two columns and interior rows of hardwoods like Chinese or Ameri-

can Elm alternated with Hackberry, Green Ash or Russian Olive, all closely spaced. Cedar may be used in the shrub row next to the buildings.

Trees to Plant

For rapid growth on dry soil plant Chinese Elm. On sites with moisture 6 to 15 feet below the surface, plant Cottonwood alternated with Boxelder, Ash or Hackberry.

For strong hardwood for farm repairs, fence posts and fuel use Honey Locust with Hackberry, Green ash or American elm, alternated for insect resistance and better soil adaptation.

For dense hedge effect to check ground sweep of wind, reduce evaporation, conserve moisture, hold snow and shelter birds, plant rows of shrubs on each side, as shown in chart.

For winter beauty and protection include a belt of evergreens on the side next to buildings, separated from taller trees by a row of shrubs. Low shrubs between evergreens add protection for the evergreens.

For the family table, use wild fruits. Plant a garden hedge. Manchurian apricots, Nanking cherries, chokecherries, Juneberries, buffaloberries, Hansen sandcherries, wild plums, currants and gooseberries make good jellies and preserves.

Care of Trees

Clean cultivation to eradicate weeds before they sap the soil should be practiced for four years or more. Mulching with

straw or manure is undesirable as it brings roots to the surface and makes young trees susceptible to drought.

An isolation strip 10 feet or more wide should be left between the outside row and the fence and kept clean and free of vegetation, unless erosion is likely.

On sandy land inclined to blow, a two or three-foot strip of Sudan grass or other cover is left between tree rows, or in isolation strips, to prevent blowing and collect winter snow moisture. Lister or plow furrows may be used instead as last operation.

Trees on the level contour should eventually stand on ridges which may be built by plowing or disking water-holding channels between the rows. The earlier it is done, the less damage to tree roots.

Pruning in windbreaks should be restricted to cutting back at planting time and to eliminating crotches which may split the tree later on. Trimming side branches opens the stand to the wind.

Rabbits and mice, as well as domestic livestock, should be kept from forest plantations. Rabbits and mice may be controlled by hunting, trapping, poisoning and application of repellants.

Insect damage is lessened by mixing species. Trees heavily shaded are usually less susceptible to damage by borers.

Mature Evergreens should be 6-12 ft. apart. For adequate survival, plant twice the number at half the spacing. Protecting by planting low shrubs (sandcherry or three-leaf sumac) between in the row or withholding evergreen belt until 2 or 3 years later will also help survival. Alternating pine with another evergreen makes denser growth.

Silver and Red Cedar are most drouth resistant. Red Cedar should not be planted near apple trees.

Caragana, Chinese Elm, Ponderosa Pine, Cedars thrive on deep, well-drained soils. They are suitable for drier sites.

Cottonwood, White Willow, Boxelder, Dogwood require subsoil moisture or high water table. Boxelder should be planted only between other varieties.

Honey Locust, when planted in northern South Dakota, should come only from northern seed and be alternated with other species.

Silver Maple, American Linden, Colorado Spruce and Black Hills Spruce are recommended only for the more favorable sites of the two eastern tiers of South Dakota counties.

Siberian Buckthorn (*R. dahurica*) is the only buckthorn which should be planted. The common buckthorn harbors the crown rust of oats.

Kentucky Coffee Tree is hardy from Brookings county south.

Black Walnut thrives best on deep-soiled bottom lands. If planted for nuts or wood, it should be widely spaced (20 feet or more) with slower growing trees (Apricot, Crab, Russian Olive) or shrubs between.

Plan Your Windbreak

A One-Acre Windbreak for an Average Dry Site; 8 rows, 12 feet apart;
100x436 feet

A Plan is needed to

Determine the number of trees required

Select species for best results on given site

Fit species that grow satisfactorily together

The chart on Page 4 shows selection and location of trees for best development. From this information a wide or narrow windbreak or shelterbelt may be readily planned for most sites.

For average sites, with fairly uniform moisture conditions, an application of the chart on Page 6 is the ONE ACRE, 8-row windbreak, illustrated in Plan A.

For farmstead on a hill terracing for moisture collection and conservation is important. Lower rows may be quite moist and species requiring moisture can be shifted to lower rows. Deeper rooted drought-resistant species are put on the central and upper parts of the slopes. Such an arrangement is indicated in Plan B.

Row No.	Species in Each Row From Windward Side	Spacing	No. Trees
1	Chokecherry and Golden Currant	3 ft.	150
2	Russian Olive	4 ft.	100
3	American Elm, and Boxelder or Ash	6 ft.	75
4	Chinese Elm, or Cottonwood and Boxelder	8 ft.	50
5	Hackberry and Thornless Honey Locust	6 ft.	75
6	Junberry, Chokecherry, Honeysuckle	4 ft.	100
7	Ponderosa Pine and Cedar, Sandcherry	3 ft.	150
8	Seedling fruit row alternating 3 species: Manchurian Apricots (20) 22 ft. apart with Plums (20) between, Nanking Cherries (40) between Apricots and Plums	5½ ft.	80
TOTAL			780

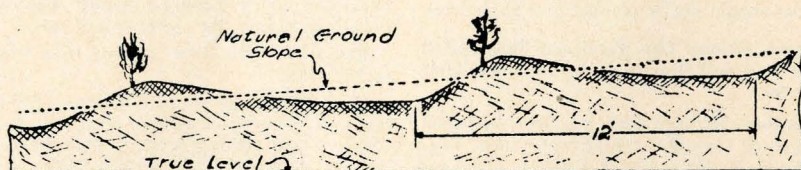
Trees should be ordered in even hundreds or their fractions. The 780 trees per acre may be reduced to 650 by eliminating Sandcherry or increasing spacing length in row 7 and a little in rows 5 and 6.

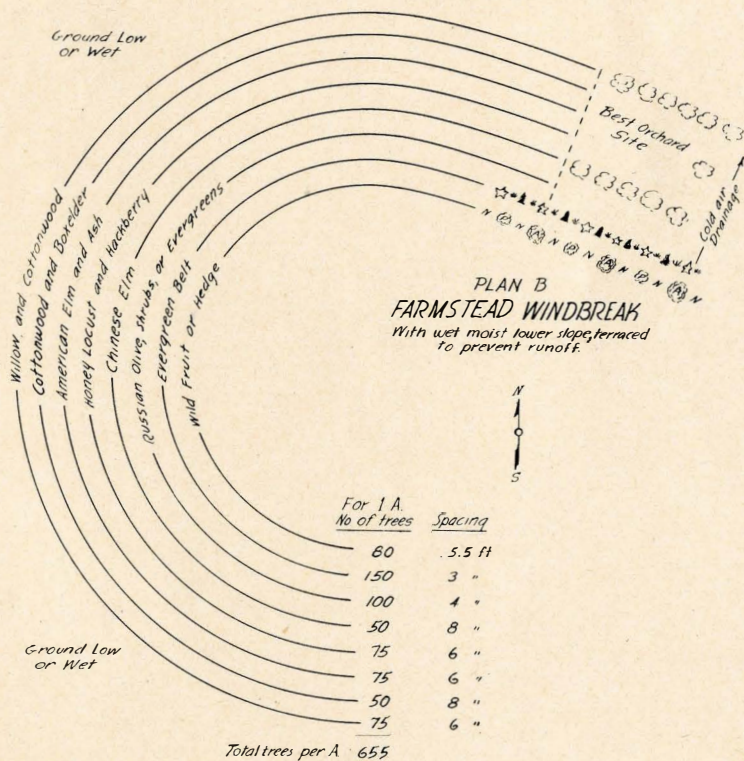
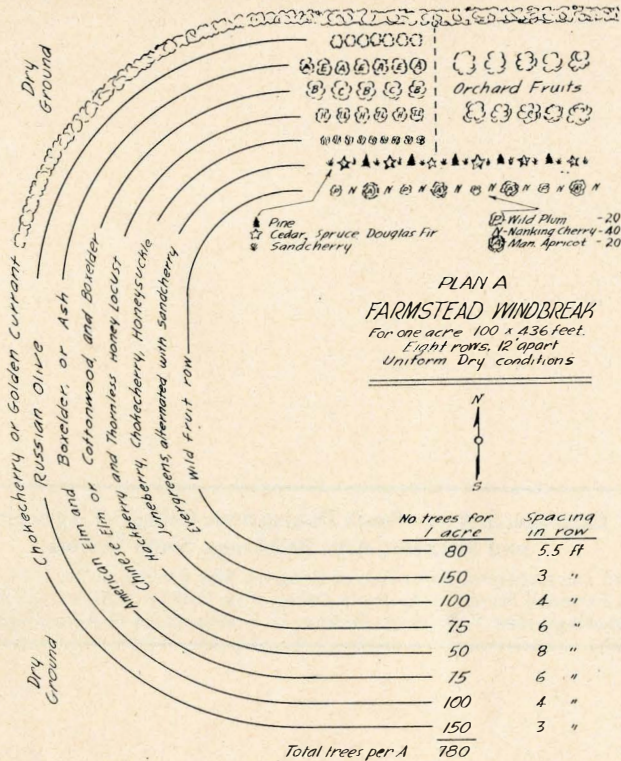
The row of shade-enduring shrubs (row 6) keeps evergreens from being overtopped by deciduous trees, aids in development of shrub undergrowth and healthy forest floor and provides temporary border hedge until rows 7 and 8 are planted.

Douglas Fir or Spruce is better than Cedar near apple orchards in eastern counties. Plant two rows of evergreens instead of one, and grow these in a protected nursery row for two years for best survival.

Short hedges of Chokecherry, Golden Currant and Russian Olive across each end of the windbreak will keep wind from blowing the length of the rows.

Contour Terraces Built During Cultivation Will Prevent Waste of Snow and Rain Water and Speed Tree Growth





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